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(54) Heat exchanger plate

(57) In a plate heat exchanger, a heat exchange medium is normally fed via a duct-forming hole 2 in one corner of the plate and has to be distributed over the width of a primary heat exchange zone 6. In order to achieve an improvement in this distribution, with a minimum pressure drop in the distribution zone 7, a distributor is attached to the zone 7, which is otherwise flat. The distributor 8 defines a series of ducts fanning out from the hole 2, some of the ducts being defined between the crests of corrugations on the distributor 8 and the plate illustrated, and some being defined between the troughs of the distributor and the next plate in the pack.

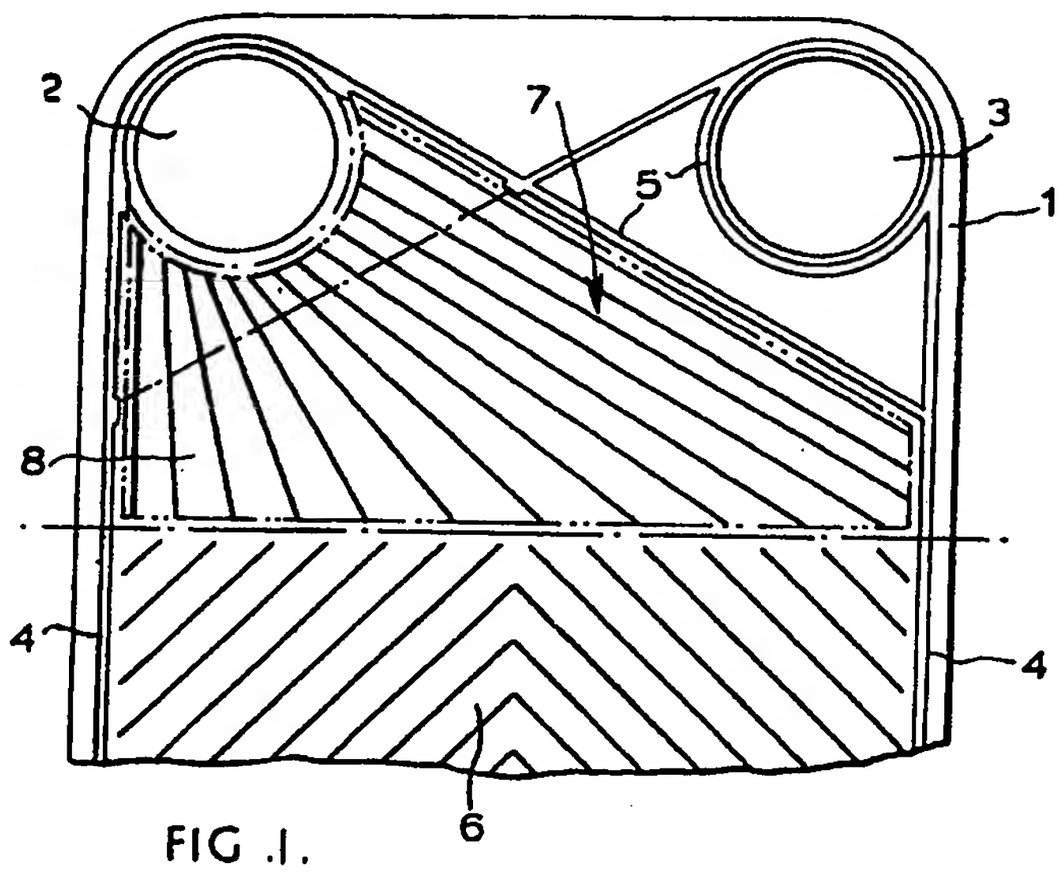

FIG .1.

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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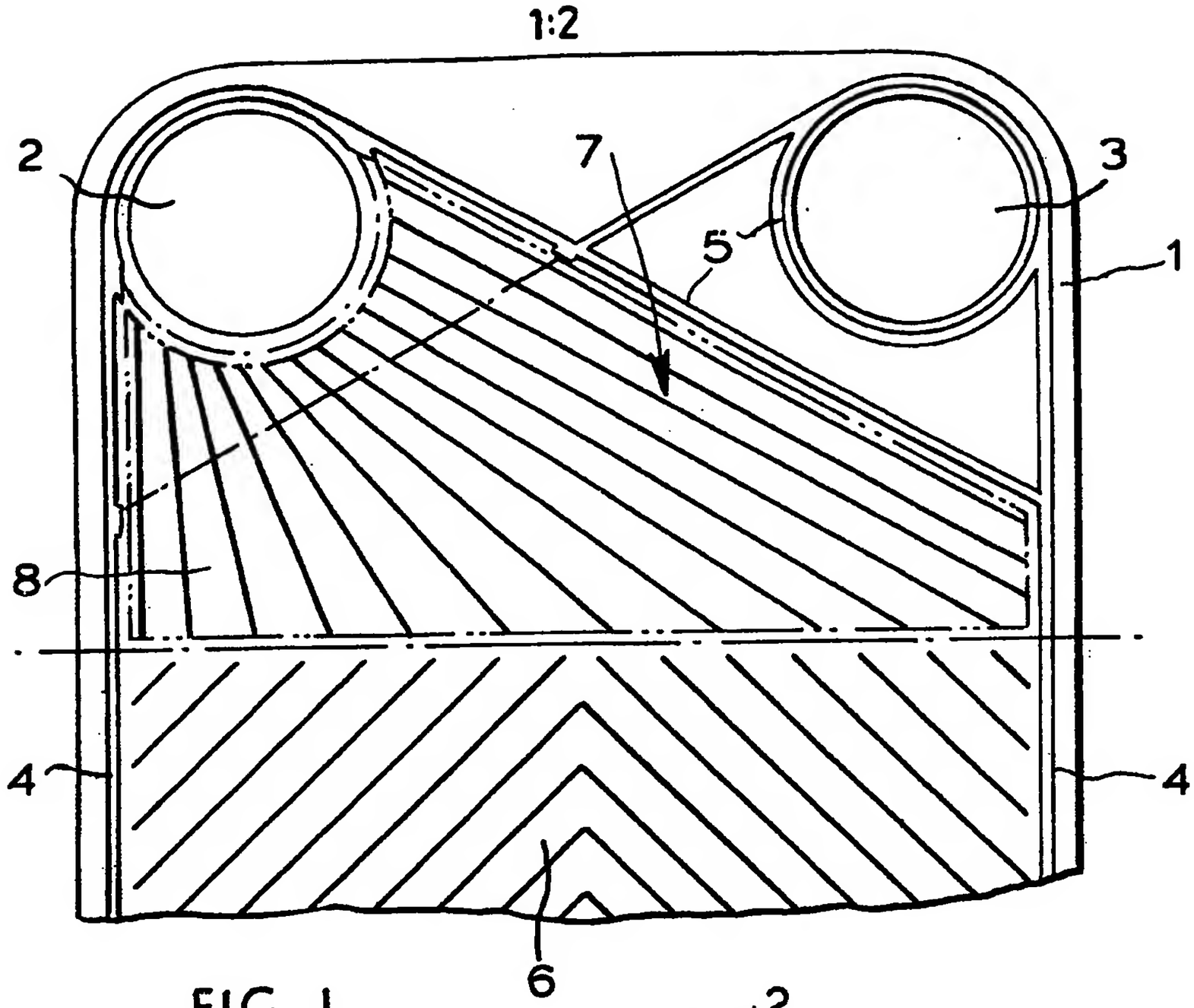

FIG .1.

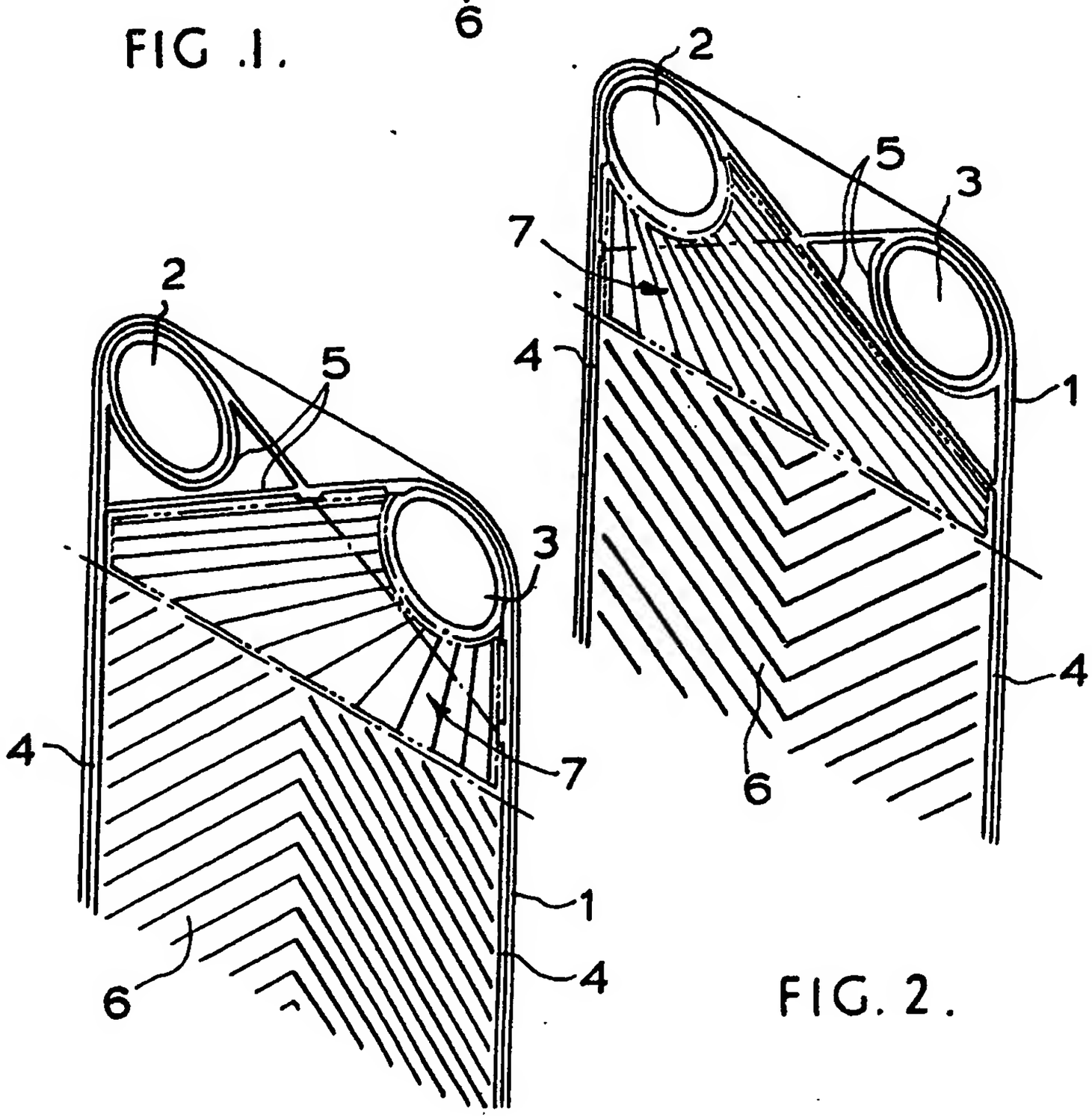

FIG. 2.

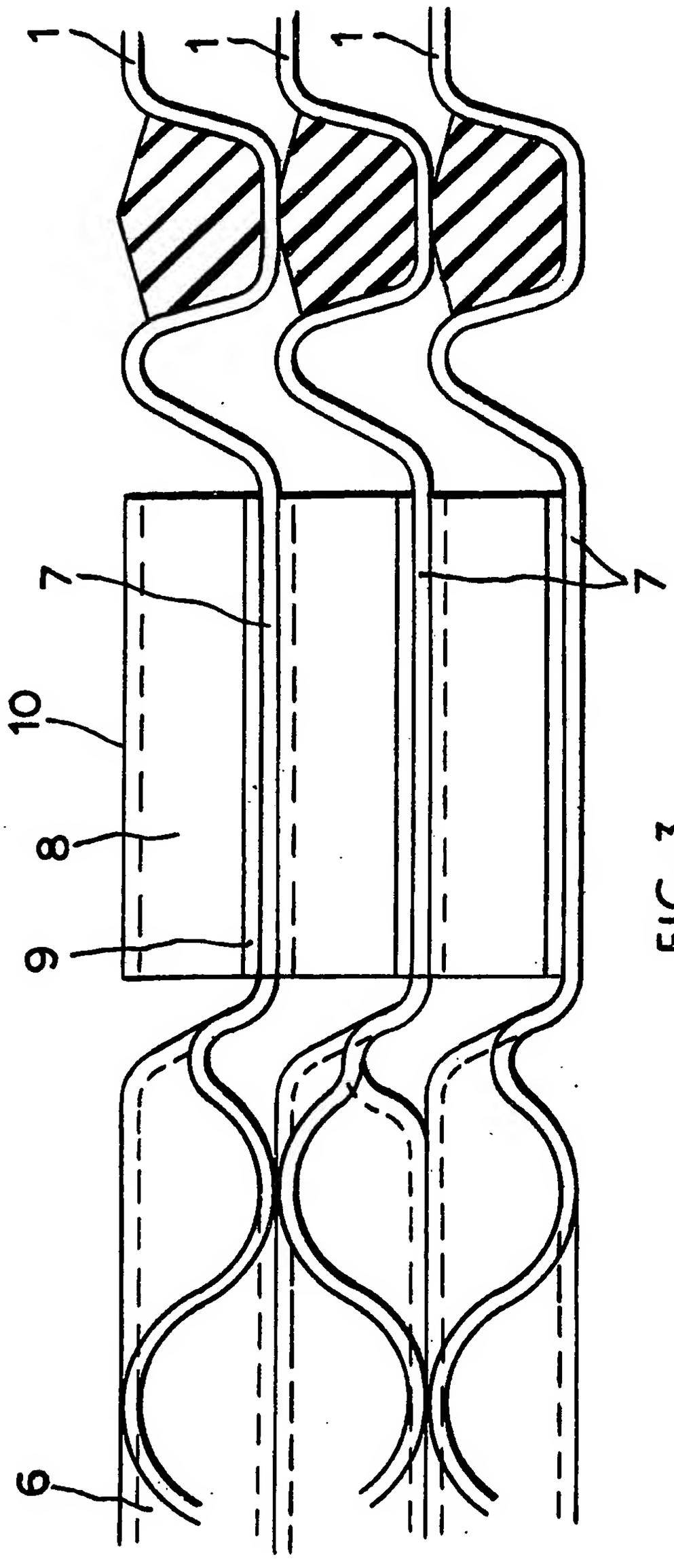

FIG. 3.

SPECIFICATION

Heat exchanger plate

This invention relates to heat exchanger plates and to heat exchangers incorporating such plates.

A plate heat exchanger comprises a separable pack of plates arranged in spaced face-to-face relationship to form flow spaces between adjacent plates. The boundaries of the flow spaces are defined by peripheral gaskets. The plates have aligned holes therein forming ports or ducts for the supply and discharge of heat exchange media to the flow spaces and further gasketing ensures that the ducts for one medium are in communication with alternate flow spaces while the ducts for the other medium communicate with the intervening flow spaces. The duct-forming holes are normally in the corners of the plates.

For various operating and manufacturing reasons it is common for the supply and discharge ducts for each medium to be on the same side of the plate, rather than diagonally opposed.

One of the design constraints in plate heat exchangers is the need to ensure that the fluid supplied from a duct at one corner of the plate is adequately distributed across the plate to reduce the tendency for the fluid flow preferentially over particular zones of the heat transfer surface, which tendency leads to uneven performance and possibly also to thermal damage to a feed liquid subjected to excessive heating.

It is conventional for a plate to have a pressed pattern of corrugations in a distribution zone between the duct-forming holes and the main part of the flow space zone, and in order to provide proper reinforcing of the plates, the corrugations have to cross and abut the corresponding corrugations in adjacent plates. This means that the flow in the distribution zone is subject to a considerable pressure drop.

According to the present invention, there is provided a plate for a plate heat exchanger of the type comprising a generally rectangular sheet having a principal heat exchange zone and distribution zones between the heat exchange zone and corner zones having holes therein to form part of supply and discharge ducts for heat exchange media, in which the said distribution zone at at least one end of the plate is generally flat and has attached thereto a distributor adapted to define with the plate and an adjacent plate a series of conduits fanning out from one of the corner holes to distribute medium fed from that corner hole to the heat exchange zone.

The distributor is preferably in the form of single pressed or profiled plate element, but it may be in the form of an insert or series of inserts between the plates.

Also, the distributor may be permanently secured to the plate by welding, pinning or adhesive or it may be removably secured thereto by mechanical interlocking.

The invention also includes a plate heat exchanger including a pack of plates according to the invention as set forth above.

The distributor provides an easy (i.e. with a low pressure drop) passage for the fluid from the duct to the heat transfer surface of the plates, whereas if the distribution is formed by pressing of the plate metal, then the fluid needs to flow through an irregular passage presenting an undesirable greater pressure drop.

The use of a distributor enables the port diameter to be modified without major tooling modifications.

The plate heat exchanger's tool development is rendered simpler as a normally complex area of the tool is produced in two separate units.

Various distributor designs can be used with the same plate design, thus improving the design flexibility.

The invention will be further described with reference to the accompanying drawings, in which:—

Figure 1 is an elevation of one end of a heat exchanger plate according to one form of the invention;

Figure 2 is a perspective exploded view of the ends of each of two successive plates in a pack; and

Figure 3 is a sectional view illustrating a portion of three successive plates in a pack.

As shown in the drawings, which are generally diagrammatical, the upper part of a plate 1 is provided with corner holes 2 and 3. The plate has peripheral gasketing 4 and further gasketing 5 which isolates one of the corner holes from the flow space or heat exchange zone. In the plate illustrated in Figure 1, the corner hole 3 is so isolated, and it will be appreciated that, as shown in Figure 2, in alternate plates the holes 2 and 3 will be alternately isolated.

The plates each include a primary flow space zone 6, which is shown as being provided with corrugations in chevron formation, and between the non-isolated corner hole and the primary flow space zone 6 there is a distribution zone 7 of the plate in which the heat exchange medium flowing from the non-isolated port has to be distributed across the width of the primary flow space zone 6.

In order to achieve this distribution, each distribution zone 7 is provided with a distributor in the form of a pressed or profiled plate having generally square section corrugations with its troughs adjacent the plate illustrated and its crests adjacent the succeeding plate so as to form a series of conduits fanning out from the non-isolated corner hole, so as to distribute the heat exchange medium from that hole across the width of the zone 6.

The distributor plate is illustrated in particular at 8 in figure 3 and the troughs of its corrugations are shown at 9 and the crests 10. Such a distributor plate 8 may be secured to the appropriate plate 1 by welding, pinning or adhesive, or alternatively it may be removably secured by means of mechanical inter-locking with appropriate formations on the plate and distributor.

The distributor 8 may be pressed, or otherwise

profiled, from stainless steel or other suitable corrosion resistant metal, or alternatively it may be formed from a suitably stiff plastics material where appropriate.

Various modifications may be made within the scope of the invention.

CLAIMS

1. A plate for a plate heat exchanger of the type comprising a generally rectangular sheet having a principal heat exchange zone and distribution zones between the heat exchange zone and corner zones having holes therein to form part of supply and discharge ducts for heat exchange media, in which the said distribution zone at at least one end of the plate is generally flat and has attached thereto a distributor adapted to define with the plate and an adjacent plate a series of conduits fanning and from one of the corner holes to distribute medium fed from that corner hole to the heat exchange zone.

2. A plate as claimed in claim 1 in which the distributor is in the form of a single pressed or profiled plate element.

3. A plate as claimed in claim 1 or 2, in which the distributor is permanently secured to the plate by welding, pinning or adhesive.

4. A plate as claimed in claim 1 or 2, in which the distributor is secured to the plate by mechanical interlocking.

5. A plate forming a plate heat exchanger substantially as hereinbefore described with reference to the accompanying drawings.

6. A plate heat exchanger including a pack of plates as claimed in any of claims 1 to 5.

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